

-69-
CLAIMS

1. A semiconductor laser driving device which performs a driving control of a semiconductor laser to control
5 current supplied to the laser so that a desired amount of emission light is obtained, said semiconductor laser driving device comprising:

a first current generating unit generating a first current that is below an oscillation threshold current of the
10 laser, and outputting the first current to the laser invariably;

a second current generating unit generating a second current that is needed for light emission of the laser responsive to an input signal, and outputting the second
15 current to the laser;

a third current generating unit generating a third current that controls the laser such that a detected amount of emission light from the laser accords with a given value, and outputting the third current to the laser;

20 an auxiliary current control unit causing the second current generating unit to generate a predetermined auxiliary current and output the auxiliary current to the laser; and

an initialization unit performing an initialization
25 operation to detect luminescence characteristics of the laser,

and outputting a signal, indicating a value of the second current derived from the detected luminescence characteristics, to the second current generating unit,

wherein the third current generating unit controls
5 the third current so that an amount of light outputted by the laser which receives a sum of the first current, the second current, the third current and the auxiliary current, accords with a predetermined amount.

10 2. The semiconductor laser driving device of claim 1 wherein the initialization unit performs the initialization operation to detect not only first luminescence characteristics of the laser at a normal temperature but also second luminescence characteristics of the laser at a
15 predetermined high temperature when a same amount of light is outputted by the laser for the two temperatures, and

wherein the auxiliary current control unit causes the second current generating unit to generate the auxiliary current so that the generated auxiliary current is larger than
20 a difference between a value of the second current derived from the first luminescence characteristics and a value of the second current derived from the second luminescence characteristics.

25 3. The semiconductor laser driving device of claim

1 wherein the second current generating unit comprises a
current-output type DAC which generates a predetermined
reference current and outputs a current based on the reference
current according to a received digital signal, and the
5 auxiliary current control unit causes the second current
generating unit to add the auxiliary current to the reference
current of the DAC.

4. The semiconductor laser driving device of claim
10 1 wherein the auxiliary current control unit comprises a
current-output type DAC.

5. The semiconductor laser driving device of claim
1 wherein the first current generating unit, the second
15 current generating unit, the third current generating unit,
the auxiliary current generating unit, and the initialization
unit are integrated on a single integrated circuit.

6. A semiconductor laser driving device which
20 performs a driving control of a semiconductor laser to control
current supplied to the laser so that a desired amount of
emission light is obtained, said semiconductor laser driving
device comprising:

a first current generating unit generating a first
25 current that is below an oscillation threshold current of the

laser, and outputting the first current to the laser
invariably;

5 a second current generating unit generating a
second current that is needed for light emission of the laser
responsive to an input signal, and outputting the second
current to the laser;

10 a third current generating unit generating a third
current that controls the laser such that a detected amount of
emission light from the laser accords with a given value, and
outputting the third current to the laser;

an auxiliary current generating unit outputting a
predetermined auxiliary current to the laser in response to a
control signal; and

15 an initialization unit performing an initialization
operation to detect luminescence characteristics of the laser,
and outputting a signal, indicating a value of the second
current derived from the detected luminescence characteristics,
to the second current generating unit,

20 wherein the third current generating unit controls
the third current so that an amount of light outputted by the
laser which receives a sum of the first current, the second
current, the third current and the auxiliary current, accords
with a predetermined amount.

25 7. The semiconductor laser driving device of claim

6 wherein the auxiliary current generating unit generates the
auxiliary current so that the generated auxiliary current is
larger than a difference between a value of the second current
derived from first luminescence characteristics of the laser
5 detected at a normal temperature and a value of the second
current derived from second luminescence characteristics of
the laser detected at a predetermined high temperature when a
same amount of light is outputted by the laser for the two
temperatures.

10

8. The semiconductor laser driving device of claim
6 wherein the auxiliary current generating unit outputs the
auxiliary current indicating a current value according to a
received signal, to the laser, and the initialization unit
15 performs the initialization operation to detect not only first
luminescence characteristics of the laser at a normal
temperature but also second luminescence characteristics of
the laser at a predetermined high temperature when a same
amount of light is outputted by the laser for the two
20 temperatures, and

wherein the initialization unit causes the
auxiliary current generating unit to generate the auxiliary
current so that the generated auxiliary current is larger than
a difference between a value of the second current derived
25 from the first luminescence characteristics and a value of the

second current derived from the second luminescence characteristics.

9. The semiconductor laser driving device of claim
5 6 wherein each of the second current generating unit and the
auxiliary current generating unit comprises a current-output
type DAC which generates a predetermined reference current and
outputs a current based on the reference current according to
a received digital signal.

10

10. The semiconductor laser driving device of claim
6 wherein the first current generating unit, the second
current generating unit, the third current generating unit,
the auxiliary current generating unit, and the initialization
15 unit are integrated on a single integrated circuit.

11. The semiconductor laser driving device of claim
1 wherein, upon start of the initialization operation, the
initialization unit causes the second current generating unit
20 to stop outputting the second current and the auxiliary
current to the laser, and causes the third current generating
unit to output the third current to the laser so that the
amount of light outputted by the laser is $1/N$ of the
predetermined amount,

25 wherein the initialization unit causes the second

current generating unit to output only the second current to the laser, detects the amount of light outputted by the laser, and causes the second current to be increased until the detected amount of light reaches the predetermined amount, and

5 wherein the initialization unit causes the third current generating unit to hold a value of the second current when the predetermined amount is reached, and causes the second current generating unit to output a new second current indicating $N/(N-1)$ of the held value of the second current, to
10 the laser.

12. The semiconductor laser driving device of claim 11 wherein the third current generating unit comprises:

15 a light amount detection unit detecting the amount of light outputted by the laser and outputting a voltage according to the detected amount of light;

 a voltage-current conversion unit converting an input voltage into a current and outputting the current to the laser;

20 a light amount control unit controlling the voltage inputted to the voltage-current conversion unit so that the output voltage of the light amount detection unit accords with a predetermined value, in order to control the amount of light outputted by the laser;

25 a first switch allowing outputting of the

controlled voltage from the light amount control unit to the voltage-to-current conversion unit, in response to a received control signal;

5 a hold capacitor holding the controlled voltage outputted from the light amount control unit to the voltage-current conversion unit through the first switch; and

a control unit controlling switching operation of the first switch by sending the control signal to the first switch.

10

13. The semiconductor laser driving device of claim 12 wherein, when a normal operation is performed immediately after the initialization operation, the initialization unit causes the discharging of the hold capacitor, and causes the control unit to activate the switching operation of the first switch so that the controlled voltage from the light amount control unit is outputted to the voltage-to-current conversion unit through the first switch.

20

14. The semiconductor laser driving device of claim 12 wherein the light amount control unit comprises:

a reference voltage generating unit outputting a first reference voltage;

25 a voltage divider outputting a second reference voltage through a voltage division of the first reference

voltage according to a received control signal; and

an operational amplifier outputting a voltage indicating a difference between the output voltage of the voltage divider and the first reference voltage,

5 wherein the initialization unit controls the voltage division of the voltage divider when performing the initialization operation, so that the amount of light outputted by the laser is changed.

10 15. A semiconductor laser driving method which performs a driving control of a semiconductor laser to control current supplied to the laser so that a desired amount of emission light is obtained, said method comprising the steps of:

15 generating a first current that is below an oscillation threshold current of the laser;

 generating a second current that is needed for light emission of the laser responsive to an input signal;

 generating a third current that controls the laser
20 such that a detected amount of emission light from the laser accords with a given value;

 performing an initialization operation to detect not only first luminescence characteristics of the laser at a normal temperature but also second luminescence
25 characteristics of the laser at a predetermined high

temperature when a same amount of light is outputted by the laser for the two temperatures; and

generating an auxiliary current so that the generated auxiliary current is larger than a difference

5 between a value of the second current derived from the first luminescence characteristics and a value of the second current derived from the second luminescence characteristics;

wherein the third current is controlled so that an amount of light outputted by the laser which receives a sum of
10 the first current, the second current, the third current and the auxiliary current, accords with a predetermined amount.

16. The method of claim 15 wherein, upon start of the initialization operation, outputting of the second current
15 and the auxiliary current to the laser is stopped, and the third current is outputted to the laser so that the amount of light outputted by the laser is $1/N$ of the predetermined amount,

wherein only the second current is outputted to the
20 laser, the amount of light outputted by the laser is detected, and the second current is increased until the detected amount of light reaches the predetermined amount, and

wherein a value of the second current when the predetermined amount is reached is held, and a new second
25 current indicating $N/(N-1)$ of the held value of the second

current is outputted to the laser.

17. The method of claim 15 wherein the third current generating step comprises:

5 detecting the amount of light outputted by the laser and outputting a voltage according to the detected amount of light;

 converting an input voltage into a current and outputting the current to the laser;

10 controlling the input voltage so that the output voltage in the light amount detecting step accords with a predetermined value, in order to control the amount of light outputted by the laser;

 allowing outputting of the controlled voltage in
15 the light amount control step, in response to a received control signal; and

 holding the controlled voltage by a hold capacitor.

18. The method of claim 17 wherein, when a normal
20 operation is performed immediately after the initialization operation, discharging of the hold capacitor is caused, and the controlled voltage in the light amount control step is outputted.

25 19. An image forming apparatus including a

semiconductor laser driving device which performs a driving control of a semiconductor laser to control current supplied to the laser so that a desired amount of emission light is obtained, said semiconductor laser driving device comprising:

5 a first current generating unit generating a first current that is below an oscillation threshold current of the laser, and outputting the first current to the laser invariably;

 a second current generating unit generating a
10 second current that is needed for light emission of the laser responsive to an input signal, and outputting the second current to the laser;

 a third current generating unit generating a third current that controls the laser such that a detected amount of
15 emission light from the laser accords with a given value, and outputting the third current to the laser;

 an auxiliary current control unit causing the second current generating unit to generate a predetermined auxiliary current and output the auxiliary current to the
20 laser; and

 an initialization unit performing an initialization operation to detect luminescence characteristics of the laser, and outputting a signal, indicating a value of the second current derived from the detected luminescence characteristics,
25 to the second current generating unit,

wherein the third current generating unit controls the third current so that an amount of light outputted by the laser which receives a sum of the first current, the second current, the third current and the auxiliary current, accords
5 with a predetermined amount.

20. An image forming apparatus including a semiconductor laser driving device which performs a driving control of a semiconductor laser to control current supplied
10 to the laser so that a desired amount of emission light is obtained, said semiconductor laser driving device comprising:

a first current generating unit generating a first current that is below an oscillation threshold current of the laser, and outputting the first current to the laser
15 invariably;

a second current generating unit generating a second current that is needed for light emission of the laser responsive to an input signal, and outputting the second current to the laser;

20 a third current generating unit generating a third current that controls the laser such that a detected amount of emission light from the laser accords with a given value, and outputting the third current to the laser;

an auxiliary current generating unit outputting a
25 predetermined auxiliary current to the laser in response to a

control signal; and

an initialization unit performing an initialization operation to detect luminescence characteristics of the laser, and outputting a signal, indicating a value of the second
5 current derived from the detected luminescence characteristics, to the second current generating unit,

wherein the third current generating unit controls the third current so that an amount of light outputted by the laser which receives a sum of the first current, the second
10 current, the third current and the auxiliary current, accords with a predetermined amount.

15

20

25